

COMMENTS TO THE FEDERAL COMMUNICATIONS COMMISSION

As a radio listener and former commercial broadcaster, I'd like to urge the Federal Communications Commission to scrap In-Band, On-Channel Digital Audio Broadcasting (IBOC-DAB), or the so-called "HD Radio" system. In fact, this system should be scrapped altogether. "HD Radio" is spectrally inefficient, and does not deliver the improved sound quality it promises.

On the AM band, it simply wastes spectrum space and has been proven to reduce coverage areas. An example of the reduced coverage AM stations operating IBOC can be found at WBBM Chicago, IL, operating at 780 kHz. In analog mode during daytime hours, the station's signal strength was good in the northern suburbs of St. Louis as received on a General Electric Superadio III, even with a local station on 770 kHz, WEW St. Louis, MO. When the IBOC signal is added, WBBM is barely audible during the daytime.

An example of the spectral inefficiency of "HD Radio" can be found at one of my local stations, KFUE Clayton, MO, operating at 850 kHz. Listeners to KFUE have complained of reduced coverage since the station commenced IBOC operations. In addition, listeners to WCBW Highland, IL, operating on 880 kHz, in the immediate St. Louis area have had to put up with increased interference to their signal from the digital sidebands of KFUE; it is something they do not want to put up with anymore. The wastefulness of the "HD Radio" system is illustrated in the comparison between KFUE in analog

and IBOC modes; KMOX St. Louis, MO, operating on 1120 kHz, has also made plans for IBOC, and the projected interference is also displayed here.

With KFUE, two different sets of measurements were taken. This measurement of interference levels was taken at a location in Hazelwood, MO, roughly ten miles from the station's transmitter site on the campus of Concordia Seminary in Clayton, MO. Once again, the General Electric Superadio III was used to take these measurements.

<u>Frequency</u>	<u>KFUE in analog mode</u>	<u>KFUE in IBOC mode</u>
800 kHz	KREI Farmington, MO (clear)	KREI Farmington, MO (clear)
810 kHz	WHB Kansas City, MO (clear)	WHB Kansas City, MO (with moderate interference)
820 kHz	WCSN Chicago, IL (weak)	Wiped out by digital sideband interference
830 kHz	KOTC Kennett, MO (fair in Stereo)	Wiped out by digital sideband interference
840 kHz	In both instances, this frequency is	wiped out by sideband interference
850 kHz	KFUE has excellent sound quality	KFUE's sound quality is tinny, at best
860 kHz	In both instances, this frequency is	wiped out by sideband interference
870 kHz	WINU Shelbyville, IL (weak)	Wiped out by digital sideband interference
880 kHz	WCBW Highland, IL (clear)	WCBW Highland, IL (with severe interference)
890 kHz	WLS Chicago, IL (good)	WLS Chicago, IL (with moderate interference)
900 kHz	KFAL Fulton, MO (clear)	KFAL Fulton, MO (clear)

The following measurements of KFUE's digital interference was taken in the 7700 block of Clayton Road in Richmond Heights, MO, about one mile from the campus of Concordia Seminary using a Jensen CD3100X car radio with compact disc player. This illustrates how IBOC wipes out an even larger amount of spectrum space.

<u>Frequency</u>	<u>KFUE in analog mode</u>	<u>KFUE in digital mode</u>
800 kHz	KREI Farmington, MO (clear)	KREI Farmington, MO (with moderate interference)
810 kHz	WHB Kansas City, MO (clear)	Wiped out by digital sideband interference
820 kHz	Image from KFUE	Wiped out by digital sideband interference
830 kHz	KOTC Kennett, MO (fair)	Wiped out by digital sideband interference
840 kHz	In both cases, KFUE's sidebands make this frequency unusable	
850 kHz	KFUE with excellent audio quality	KFUE with tinny audio quality
860 kHz	In both cases, KFUE's sidebands make this frequency unusable	
870 kHz	In both cases, KFUE's sidebands make this frequency unusable	
880 kHz	WCBW Highland, IL (clear)	WCBW Highland, IL (nearly inaudible)
890 kHz	WLS Chicago, IL (fair)	Wiped out by digital sideband interference
900 kHz	KFAL Fulton, MO (fair)	KFAL Fulton, MO (with severe interference)

In this case, WCBW's signal can barely be heard with KFUE transmitting the IBOC signal. At a distance of ten miles, KFUE's IBOC transmissions wipe out 50 kHz of valuable radio spectrum. At a distance of one mile, those same transmissions wipe out 80 kHz of spectrum space, with moderate to severe interference up to 50 kHz on either side of the center channel. KFUE has also demonstrated a lack of respect for the signals of WHAS Louisville, KY, operating at 840 kHz, and KKOW Pittsburg, KS, operating at 860 kHz, by keeping the IBOC signal on until sign-off time, usually 30 minutes to one hour after sunset, when they should be analog-only for the last 30 minutes to one hour of their broadcast day. I monitored the station on July 4, 2005; they kept the IBOC signal on after they were supposed to turn it off at 8:30 p.m. Central Daylight Time. They kept it on until the station signed off at 8:59 p.m. Central Daylight Time, causing unnecessary interference to WHAS and KKOW, as well as other stations operating on 850 kHz. Keeping an IBOC signal on past local sunset is a violation of FCC rules.

KFUE operates at 5,000 watts of power; KMOX, with ten times the power level of KFUE, will do the same thing to the signal of WRYT Edwardsville, IL, operating at 1080 kHz. Below is a table of projected interference should KMOX add IBOC service:

<u>Frequency</u>	<u>With KMOX in Analog mode (Mono/Stereo)</u>	<u>With KMOX in Digital mode</u>
1070 kHz	KHMO Hannibal, MO (good to fair signal)	Severe digital sideband interference
1080 kHz	WRYT Edwardsville, IL (clear)	Nearly inaudible
1090 kHz	WCRA Effingham, IL (fair signal)	Wiped out by digital interference
1100 kHz	Clear	Wiped out by digital interference
1110 kHz	In both cases, sidebands from KMOX wipes out any signals on 1110 kHz	

1120 kHz	Center frequency	Center frequency
1130 kHz	In both cases, sidebands from KMOX wipes out any signals on 1130 kHz	
1140 kHz	WVEL Pekin, IL (Fair signal)	Wiped out by digital interference
1150 kHz	WGGH Marion, IL (Fair signal)	Wiped out by digital interference
1160 kHz	WYLL Chicago, IL (Poor signal)	Wiped out by digital interference
1170 kHz	KUGT Jackson, MO (Fair signal)	Severe digital sideband interference

From 1988 to 2000, KMOX operated with the proven Motorola Compatible Quadrature Amplitude Modulation (C-QUAM) AM Stereo system. This system never caused the interference to adjacent channel signals that "HD Radio" will cause. Since KMOX operates with 50,000 watts of power full-time, it would render the signal of WRYT, which operates with 500 watts of power during daylight hours only, absolutely useless. Both WCBW and WRYT are used as Christian ministry outreaches; their ability to minister to their respective faithful will be severely hampered if IBOC-DAB ("HD Radio") is approved for around-the-clock service on AM. This, by far, is an inefficient use of AM radio spectrum, and should never have been allowed in the first place. This proves, beyond the shadow of a doubt, that the AM broadcast band is not suited for digital audio broadcasting of any kind.

IBOC-DAB, or "HD Radio", is an inefficient use of FM spectrum as well. More spectrum space is wasted on FM than on AM radio; up to 600 kHz of valuable FM spectrum is wasted on "HD Radio". As an example of how wasteful IBOC is on FM radio, I took a measurement of the signal of WVRV East St. Louis, IL, operating at 101.1 MHz, using a Kenwood AR-304, modified by Dr. Bruce Elving of Esko, MN, for maximum selectivity, and an Antenna Performance Specialties APS-9B yagi antenna specifically designed

for FM radio. This is measured from the same location as the first set of measurements for KFUE (AM).

<u>Frequency</u>	<u>WVRV in analog mode</u>	<u>WVRV in digital mode</u>
100.8 MHz	Very minor sidebands from 100.7/101.1	Wiped out by digital sideband interference
100.9 MHz	Primarily KTUI-FM Sullivan, MO	Wiped out by digital sideband interference
101.0 MHz	Analog sidebands from WVRV	Wiped out by sideband interference
101.1 MHz	Center frequency	Center frequency
101.2 MHz	Analog sidebands from WVRV	Wiped out by sideband interference
101.3 MHz	Primarily KTXR Springfield, MO	Wiped out by digital sideband interference
101.4 MHz	Very minor sidebands from WVRV	Wiped out by digital sideband interference

Another sign of proof that IBOC is inefficient on the FM band is measured with KATZ-FM Alton, IL, operating at 100.3 MHz. In this case, a Christian radio station operates on an adjacent channel: KDJR De Soto, MO, operating at 100.1 MHz. KATZ-FM, by going to "HD Radio", has greatly impaired the ministry outreach of KDJR, already forcing a relay station on 101.5 MHz near Bellefontaine Neighbors, MO, built to beam KDJR's programming into the Alton/Wood River area in Illinois, off the air. It has also negatively impacted the coverage of WYMG Jacksonville, IL, operating at 100.5 MHz, and caused significant interference to KFNS-FM Troy, MO, operating at 100.7 MHz. These measurements were also taken at Hazelwood with the same equipment.

<u>Frequency</u>	<u>Station</u>	<u>KATZ-FM in Analog Mode</u>	<u>KATZ-FM in Digital Mode</u>
99.8 MHz		Sidebands from 99.7/99.9	Wiped out by sideband interference
99.9 MHz	KFAV Warrenton, MO	Semi-local signal in Stereo	Minor interference to Stereo pilot
100.0 MHz		Sidebands from 99.9/100.3	Wiped out by sideband interference
100.1 MHz	KDJR De Soto, MO	Semi-local signal	Wiped out by digital sidebands
100.2 MHz		Sidebands from 100.3	Wiped out by digital sidebands
100.3 MHz	KATZ-FM Alton, IL	Center frequency	Center frequency
100.4 MHz		Sidebands from 100.3	Wiped out by digital sidebands
100.5 MHz	WYMG Jacksonville, IL	Fair signal	Wiped out by digital sidebands
100.6 MHz		Sidebands from 100.3/100.7	Wiped out by digital sidebands
100.7 MHz	KFNS-FM Troy, MO	Semi-local signal in Stereo	Minor interference to Stereo pilot

In this case, KFNS-FM suffers from interference from two IBOC operators. Therefore, the station's ability to serve listeners east of St. Peters, MO is severely affected by the digital sideband interference from both KATZ-FM and WVRV.

From an audio quality standpoint, "HD Radio" is really low-definition radio. It does not deliver on its claim that "it will bring FM-quality sound to AM, and bring CD-quality sound to FM." The audio quality of "HD Radio" is equal to an Internet radio station accessed via dial-up computer modem; very poor. Another example to compare "HD Radio" to is a digital cellular phone in a low signal area. Unlike with analog radio, where listeners won't miss a beat of their favorite song or a word of what a talk show host is saying when signal strength is reduced momentarily, "HD Radio" will force listeners to lose notes or even whole verses of their favorite songs or whole sentences from their favorite talk show host when signal strength is reduced momentarily. The only true "high-definition radio" will come from improved analog receivers using new chipsets, such as the "Symphony" chipsets being introduced by Motorola, not from iBiquity's fatally flawed system. The money being wasted by radio stations on "HD Radio" should have been better spent on hiring air talent or converting monaural AM radio stations to C-QUAM AM Stereo.

AM and FM radio are not the only services being threatened with desecration from unproven digital modes. The international shortwave

broadcast bands also face desecration by another unproven system, Digital Radio Mondiale (DRM). Unlike with "HD Radio", DRM does not have an analog component. DRM wastes 50 kHz of valuable spectrum space. An example of this is when the Canadian Broadcasting Corporation uses DRM on 9.800 MHz from their shortwave relay station in Sackville, New Brunswick, southeast of Moncton. At the same Hazelwood, MO location where the measurements for KATZ-FM, KFUE (AM) and WVRV (FM) were taken, the DRM transmissions from the CBC relay station causes interference to stations operating between 9.775 and 9.825 MHz, wiping out 9.78 to 9.82 MHz, except when Radio Havana Cuba is broadcasting on 9.82 MHz; then, the upper limit of the adjacent channel wipeout is 9.815 MHz. DRM is also incompatible with the existing receivers in the marketplace, as is the case with "HD Radio" signals with the analog component removed. The average American consumer does not have the money to purchase new receivers to replace the current, proven receivers in the marketplace; the American public has demonstrated that it does not want terrestrial digital radio, nor is there a market for such technology. If he or she wants digital radio, subscribe to satellite radio. Digital signals in the U.S. marketplace should be confined to satellite radio only.

It is in the best interests of all involved to scrap "HD Radio" altogether. The benefits that will result from scrapping "HD Radio" greatly outweigh the risks. Listeners to smaller stations like WCBW (AM) and KDJR (FM) will

greatly benefit from the elimination of "HD Radio" by being able to listen to *their favorite stations without the unnecessary interference from digital* sidebands, as they did before IBOC was approved. It will also greatly benefit the outreach ministries of Christian radio stations like KDJR (FM) or Catholic radio apostolates like WRYT (AM); they will find their ability to reach out to their local communities enhanced with the elimination of "HD Radio". The consumer will also benefit with greatly improved audio quality from their favorite radio stations, instead of the degraded audio quality that "HD Radio" really offers.

In a real-world environment, both "HD Radio" and DRM are not workable. It has brought AM, FM and shortwave radio to the lowest interference standards in the history of the medium. An unnecessary amount of interference and reduced coverage areas are not what the listeners want. It is recommended that interference standards on the AM broadcast band be brought back within compliance with pre-IBOC parameters, along with a return to the C-QUAM standard for stereophonic broadcasting on AM, with the use of the proven C-QUAM system mandatory for all AM radio stations broadcasting with 50,000 watts of power using non-directional antenna systems day and night, and all AM radio stations operating between 1610 and 1700 kHz.

It is also recommended that all receivers for mobile use made after 2009 be required to not only receive C-QUAM AM Stereo transmissions, but

also receive at least four of the shortwave broadcast bands between 5.8 and 17.9 MHz and be equipped with Motorola's "Symphony" chipset; in addition, all receivers manufactured for home use should also be required to have the aforementioned chipset and receive C-QUAM AM Stereo, but not be required to receive any shortwave broadcast bands. The U.S. marketplace will accept AM Stereo and the new Motorola chipsets more readily than "HD Radio" and DRM.

Therefore, it is in the best interests of the consumer and the independent broadcaster that the Federal Communications Commission revoke type acceptance for both "HD Radio" and DRM technology, and make it illegal to transmit digital broadcast signals, with the sole exception of digital television, below 1 GHz. Frequencies below 1 GHz are simply not suited for technologies that take up massive amounts of spectrum, such as digital radio. Analog radio is spectrally efficient; the consumer can get excellent sound quality in only 10 kHz of AM spectrum space or 100 kHz of FM spectrum space. The listener deserves an interference-free signal; ending the terror of "HD Radio" is a step in the right direction for radio. I believe that proponents of "HD Radio" are not real engineers; just people who want to limit what we can hear on the radio.

Respectfully submitted by Eric S. Bueneman, Amateur Radio station

NØUIH, Hazelwood, MO, on August 7, 2005.

IBOC-AM should not be adopted. Here's why:

1) The IBOC "Hash" daytime walks over 1st and 2nd adjacent signals. Case in point *WTOP 1500 in Wheaton Md. and WARK the old WEAM 1490 in Arlington VA.* My brother in Arlington VA verified that with consumer equipment in the real world that WTOP walks all over WARK in Arlington VA. He is in Arlington VA.

Second case in point. WCOS 1400 AM IBOC Columbia, SC steps on where WAGS 1380 AM Bishopville, SC Std AM used to be heard when you get to the western edge of WAGS and the Eastern edge of WCOS. They walk on me. Now it's personal.

2) The notion that one company can force you to use intellectual property and pay a royalty to sign up and then "re-up" is akin to Mafia style protection.

3) It doesn't take an engineer to realize that if you fill the AM band with all stations broadcasting sideband hash that the dial will be filled with noise and greatly reduced coverage area.

4) From an economic standpoint it is obvious that Clear Channel wants to "Embrace Technology" to politely crush all independents. I can't prove it but that's what will happen. Remember in "Independence Day" Will Smith asked the Alien what they wanted from us and it said to "Die, Just Die".

5) There is a lot of real world imperical evidence that is ignored by Ibiquity (follow the money trail), Harris and equipment Mfg (follow the money trail), and the conglomerates that have absorbed and homogenized and in my opinion destroyed broadcasting diversity and individuality (follow the power trail).

5) Do you choose to do this not because it is better but because it is hard. Mr Littlejohn (Clear Channel who has a vested interest in IBOC) and NRSC proposes reduced frequency response to make a complicated, noisy & expensive technology fit in the spectrum with no improvement in quality. This doesn't pass the "No Duh" Test.

6) All existing equipment will be rendered obsolete for no valid purpose other than squashing small town radio.

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington D. D. 20554

In the matter of:

National Radio Systems Committee's
"In Band/On Channel" Digital Radio
Broadcasting Standard NRSC-5

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DA 05-1661
MM Docket No. 99-325

REPLY COMMENTS OF

Ronald J. Brey

I am making these reply comments as a private citizen.

After reading some of the comments regarding IBOC, it appears that the Commission has to make a decision between large markets and small markets when it comes to the implementation of IBOC in the medium wave (MW) band. It seems likely that although fidelity will be improved with NRSC-5, station coverage will be reduced resulting in loss of service outside the major markets.

As a frequent and longtime listener to AM radio in the MW band, I have noticed the noise created by IBOC digital broadcasting in the MW band. The noise sticks out like a sore thumb on either side of a 50 kW station even 50 miles away. The sideband interference IS really as bad as people have been saying in the comments on this matter. The sideband interference is going to reduce the choices listeners have outside the large markets. Even the 50 kW stations will have adjacent channel problems at night. And I, for one, often tune 10 kHz at a time listening to stations across the country.

Amplitude modulation has something that digital will never have, and that is hope. The listener can still decipher a weak or badly faded nighttime signal with a miniscule signal-to-noise ratio, whereas the digital audio signal under low RF signal conditions gives up. By analogy with distant 8VSB digital TV reception I have seen the picture disappear for 15 minutes, whereas with NTSC you could often get some glimpses of program content to follow the plot, no matter how shallow. Amplitude modulation is quite likely the best natural fit for medium wave transmission.

The key to preserving MW band characteristics and raising audio fidelity may rest in correcting the amplitude demodulation using error correction signals broadcast on another band. Existing MW receivers would demodulate AM signals as always. Station interference levels would stay the same. But to receivers detecting a low data rate signal embedded in the MW carrier for identification, a second signal at a different frequency could supply error correction information to improve audio fidelity, but using less bandwidth than an entire redundant broadcast. If that second signal was broadcast via satellite, the correction signal could be available nationwide to receive skywave stations. If the enhanced receiver lost the second signal, the receiver would just pass along the uncorrected amplitude modulated signal. So rather than broadcasting two redundant signals with deleterious adjacent channel issues, MW interference levels would be maintained. (I vaguely remember a similar scheme proposed or in use in Europe. I am coming to the party a little late, so excuse me if I am engaged on a path well traveled by those before me.)

Hopefully the Commission realizes that a decision in favor of NRSC-5 for the medium wave band will have a negative impact on program choices outside the major markets. This is a big guy versus little guy decision. Some of the medium wave band's long distance coverage will be lost due to adjacent channel interference for both the AM and digital modulation. If the band eventually goes to only digital modulation, groundwave and skywave coverages will decrease due to the all-or-nothing characteristics of digital transmission.

NRSC-5 is not a good choice for the Medium Wave Band. Amplitude modulation is not perfect, but by itself, it serves the whole country better than NRSC-5 will. IBOC for the medium wave band is a great concept, but NRSC-5 is a faulty implementation. And that's a shame.

Sincerely,

Ronald J. Brey
6815 Academy Trail
Rockford, IL 61107

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Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of:)
)
Digital Audio Broadcasting Systems) MM Docket No. 99-325
And Their Impact on the Terrestrial)
Radio Broadcast Service)

Reply Comments of Barry D. McLarnon

I am independent consultant and professional engineer, filing these reply comments as an individual.

NRSC-5 Does Not Meet the Requirements of an Open Broadcast Standard

Many of the recent comments in this proceeding have dealt with the question of whether NRSC-5 meets the necessary criteria to be considered a suitable standard for radio broadcasting. The comments from the NAB¹ make much of the fact that the NRSC DAB Subcommittee adopted NRSC-5 as a standard without a single "no" vote being cast. They neglect to mention, however, that a sizeable number of the subcommittee members (seven) felt that NRSC-5 was incomplete and should not be committed to a vote at that time. These members were persuaded to abstain rather than cast a negative vote; however, several of them have displayed the courage of their convictions and have now come forward to cast a "no" vote in this proceeding. In particular, Mr. Jonathon Hardis has made a compelling case² for rejecting NRSC-5 until such time as iBiquity fulfils its obligation to provide an

¹ Comments of the National Association of Broadcasters, filed July 18, 2005.

² Comments of Jonathan E. Hardis, filed July 14, 2005.